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M.C.A. (Semester – II) (Mgmt. Faculty) Examination, 2010
MT 21 : PROBABILITY AND COMBINATORICS
(Old)(2005 Pattern)

Time : 3 Hours   Max. Marks : 70

N.B. : 1) Question No. **1** is **compulsory**.
         2) Attempt **any 2** questions from question No. **2** to question No. **4.**
         3) Figures to **right** indicate full marks.
         4) Use of Calcualtors and Statistical Tables is **allowed**.

1. a) What is the probability that a number selected randomly from 1 to 5000 is divisible by 2 or 5 or 9. **6**

   b) Determine the discrete numeric function of generating function .

$$A(z) = \frac{1}{5 - 6z + z^2} .$$ **6**

   c) Let A, B & C be three mutually exclusive and exhaustive events defined on sample space S. If P (A) = 2 P (B) = 3 P(C). Find P (A$\cup$B). **6**

   d) Obtain mean and variance of Poisson distribution. **6**

   e) An explosion in a factory manufacturing explosions can occur due to

     i) short circuit

     ii) defects in machinery

     iii) negligence of workers.

   The probabilities of these causes are known to 0.25, 0.4 and 0.35 resp.

   The engineers feel that an explosion can occur with probabilities

     i) 0.35 if there is a short circuit

     ii) 0.2 if there are defects in machinery

     iii) 0.4 if the workers are negligent.

   Given that an explosion has occurred determine that it is due to workers negligence. **6**

P.T.O.

2. a) The life time of a certain type of battery has mean of 310 hours with a standard deviation of 32 hours. Assuming that the distribution is normal. Find

   1) Proportion of batteries having life time between 225 and 360 hours.

   2) The life in hours above which we will find best 15% of the batteries.   **8**

   b) If $f(x, y) = e^{-(x+y)}$

$$= 0 \quad \begin{array}{l} x \geq 0, y \geq 0 \\ 0.\omega \end{array}$$

   is the joint p.d.f. of (X,Y) find

   i) $P(X < 1)$

   ii) $P(X > Y)$ **6**

   c) Find the number of integer solutions of equation $x_1 + x_2 + x_3 = 30$ subject to the condition $4 \leq x_1 \leq 9$, $7 \leq x_2 \leq 14$, $10 \leq x_3 \leq 24$.   **6**

3. a) Find Mean and variance of exponential distribution.   **8**

   b) Given below is the joint p.m.f. of (X, Y)

Y X	1	2	3
–1	k	2k	3k
0	2k	4k	5k
1	3k	5k	6k

Find

   i) K

   ii) Marginal distribution of X and Y.

   iii) Conditional distribution of X given Y = 2

   iv) P (Y > 2/ X < 1)   **6**

c) Find the coefficient of xyz^{-2} in $\left(x - 2y + \dfrac{3}{z}\right)^4$.   **6**

4. a) Find expectation of sum of the outcomes when two dice are rolled. Hence find variance.   **8**

   b) Solve recurrence relation $a_n + 6\,a_{n-1} + 9a_{n-2} = 3$ for n > 1 given $a_0 = 0$ and $a_1 = 1$ **6**

   c) Define moment generating function and comulant generating function with the properties.   **6**

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